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Appl. No.: 10/003,574 Confirmation No.: 5083
Applicant(s): Kuoksa
Filed: 10/24/2001
Art Unit: 1754
Examiner: S. Hendrickson
Title: METHOD AND APPARATUS FOR CONTROLLING A CAUSTICIZING
PROCESS

Customer No.: 00826

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**APPEAL BRIEF TRANSMITTAL
(PATENT APPLICATION – 37 C.F.R. § 41.37)**

1. Transmitted herewith is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on March 22, 2010.
2. ☐ Applicant claims small entity status.
3. Pursuant to 37 C.F.R. § 41.20(b)(2), the fee for filing the Appeal Brief is:
☐ small entity \$270.00
☐ other than small entity \$540.00

Appeal Brief fee due: \$

☒ **The fee was paid with the first Appeal Brief filed on May 16, 2008, and therefore no new fee is due (see MPEP 1207.04).**

☒ Any additional fee or refund may be charged to Deposit Account 16-0605.

Respectfully submitted,



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant(s): Kuoksa
Filed: October 24, 2001
Art Unit: 1754
Examiner: S. Hendrickson
Title: METHOD AND APPARATUS FOR CONTROLLING
A CAUSTICIZING PROCESS

Docket No.: 033047/240187
Customer No.: 00826

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APPEAL BRIEF UNDER 37 CFR § 41.37

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed March 22, 2010.

1. ***Real Party in Interest.***

The real party in interest in this appeal is Metso Paper Automation Oy, the assignee of the above-referenced patent application.

2. ***Related Appeals and Interferences.***

There are no related appeals and/or interferences involving this application or its subject matter.

3. ***Status of Claims.***

Claims 1-6, 8-12, 14, 15, and 26 are pending and all claims stand rejected as failing the written description requirement and as being unpatentable over a combination of references as set forth in greater detail below. The written description and prior art rejections of all pending claims are appealed herein.

Claims 7, 13, 16 – 25 have been cancelled.

4. ***Status of Amendments.***

No claims were filed subsequent to the Final Office Action.

5. ***Summary of Claimed Subject Matter.***

The present invention as embodied in independent Claim 1 is directed to a method of controlling a causticizing process for producing white liquor from green liquor in which the density of the green liquor being fed to the slaker is controlled to a set value that is calculated based on the total titratable alkali (TTA) in the green liquor, the target value for the TTA, and a model that relates green liquor density to the measured TTA in the green liquor. The invention also includes a method for controlling a slaker within a causticizing process in which the density of the green liquor inlet stream is determined using a specific mathematical equation that is set forth in independent Claim 26.

In the production of pulp, the Kraft recovery process is widely used to recover chemicals, such as NaOH, from the black liquor, which is a byproduct of the pulping process. The recovery is a multi-step process in which the black liquor is combusted to produce smelt. The smelt is then dissolved in a dissolving tank to form a green liquor, which is subsequently fed into a slaker where it is reacted with lime in a causticizing reaction to convert Na_2CO_3 into NaOH. The resulting mixture is clarified to remove the liquid phase, also referred to as the white liquor, from the solid phase. The white liquor can then be recycled to use in pulp digestion at the beginning of the process.

The invention defined in independent Claim 1 is directed to a method of controlling the causticization process in which the green liquor being fed into the slaker is at a controlled

density. See page 9, lines 1 – 3. To provide enhanced control over the process, and hence recover a greater amount of NaOH from the green liquor, Appellants have discovered that improved control over the causticization reaction can be achieved by applying a model that correlates density of the green liquor to the total titratable alkali (TTA) in the green liquor. In the claimed process, the density of the green liquor entering the slaker is measured and adjusted towards a set value. On page 8, lines 33 through page 9, line 12, and in Figure 1, the specification describes that the set value for the green liquor is determined in a multi-step process in which a target value for the total titratable alkali (TTA) in the green liquor is determined, the TTA of the green liquor is measured, and a model is provided that relates green liquor density to TTA. The model is then used to calculate the set value for the green liquor density based on the measured TTA and the target value for the TTA. The model used to calculate the set density is also updated using the measured density of the green liquor and the TTA. See page 9, lines 26-31. Applicants have discovered that the process steps recited in Claim 1 provide greater control over the causticizing process, which in turn results in greater amounts of NaOH being recovered.

Independent Claim 26 is directed to a method of controlling a slaker within a causticizing process in which the density of the green liquor is adjusted by adding an effective amount of white liquor into a green liquor inlet stream in which the density of the green liquor stream is determined using the following equation, which can be found in the specification on page 10, lines 1 – 14:

$$D = (TTA + os) / kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset, which is determined using a model having as parameters the green liquor TTA and momentary density of green liquor; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same.

Similarly, dependent Claim 11, which is dependent on independent Claim 1, recites that the green liquor density is controlled on the basis of a total titratable alkali by applying the following equation:

$$D = (TTA + os) / kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same,

the offset being determined on the basis of the model.

As shown in Figure 2 and discussed on page 9, lines 18 – 20, the measured TTA and measured density of the green liquor are used to calculate an offset using the model. The offset can then be used with the target TTA and the angular coefficient to calculate the density of the green liquor. See e.g., page 10, lines 15 – 21.

6. *Grounds of Rejection to be Reviewed on Appeal.*

Claims 1-6, 8-12, 14, 15 and 26 have been rejected under 35 U.S.C. § 112, second paragraph, as failing to comply with the written description requirement. Specifically, the Examiner contends there is no support for the step of “updating the model” in the specification.

Claims 1-6, 8-12, 14, 15, and 26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of U.S. Patent No. 5,822,220 to Baines, U.S. Patent No. 5,213,663 to Musow, U.S. Patent No. 4,311,666 to Hultman et al., U.S. Patent No. 4,762,590 to Engdahl, Canadian Patent No. 1198558 to Bertelsen, and the Puhakka article.

In the rejection, the Office Action relies on Baines, the primary reference cited by the Examiner, for the teaching of using a computer to control a causticization and that the computer can monitor any parameter characteristic of the system. The Office Action relies on Musow for allegedly teaching that variables, such as TTA and density, can be measured in the causticizing

system. See Office Action of 2/13/2009, page 2. The Office Action relies Hultman for allegedly teaching the measurement of green density and control of white infeed. The Office Action asserts that Engdahl teaches the addition of white liquor to the process. Bertelsen is relied on for allegedly teaching measuring TTA and conductivity, and the Puhakka article is cited by the Examiner for teaching monitoring of 'alkali strength' and TTA.

In the rejections, the Examiner has taken the position that "it would be obvious to one of ordinary skill in the art at the time the invention was made to control the infeeds as in Hultman and monitor the density or alkali in the process of Baines, using the supporting references, because doing so asserts control over the process for monitoring optimum results." See Office Action of 2/13/2009, page 2. The Examiner further asserts that the workings of how a computer system works and makes calculations is conventional and that choosing coefficients which accurately model reality is an obvious expedient, to assure efficiency.

7. ***Argument.***

A. Rejections Under 35 U.S.C. § 112, first paragraph

As discussed above, the Examiner contends that the step of "updating the model" is not supported by the written description. More specifically the Examiner asserts that in the claimed process, the data is updated and not the model. Appellants disagree with the Examiner's assertions and submit that the specification as originally filed provides ample support for the step of "updating the model" as recited in independent Claim 1. Reversal of this rejection is requested.

The written description requirement requires an Applicant to demonstrate possession of each feature of a claimed invention. The Federal Circuit has described the function of the written description requirement as "[ensuring] that, as of the filing date, the inventor conveyed with reasonable clarity to those of skill in the art that he was in possession of the subject matter of the claims." See *Union Oil Co. of Calif. v. Atlantic Richfield Co.*, 208 F.3d 989 (Fed. Cir. 2000). The standard for determining compliance with the written description requirement is, "does the description clearly allow persons of ordinary skill in the art to recognize that he or she invented what is claimed." *In re Gosteli*, 872 F.2d 1008, 1012 (Fed. Cir. 1989). See also MPEP 2163.02.

In the present case, the specification as originally filed provides support for the step of “updating the model.” An example of updating the model is shown in paragraphs 0039-0045 of the application as originally filed. In the embodiment described therein, the model that relates green liquor density to TTA is in the form: $TTA = k \cdot D - os$. The term “os” is an offset that is calculated on the basis of TTA and density and the measurement result of the total titratable alkali. For example, paragraph [0042] specifically states: “[t]he offset is calculated on the basis of a longer period of time, such as 1 to 40 hours, for example for 8 or 24 hours, and it is continuously updated.” (Emphasis Added). As described in the cited excerpt, the offset, which is part of the model, is updated. Since the offset is updated, the model also is updated. In addition, Figure 2 also shows calculation of the offset (os) and updating of the model. In view of these excerpts from the application, it is respectfully submitted that the recited language is supported by the written description and therefore Appellants respectfully request reversal of this rejection.

Further, one of ordinary skill in the art upon reading the instant application would readily understand that the recitation “updating the model” refers to updating the value of the offset which is part of the model. As such, one of ordinary skill in the art would understand and recognize that the Appellants invented what is claimed, and were in possession of the invention as of the filing date of the application. For this additional reason, Appellant request that the rejection be withdrawn.

With the respect to Claim 26, this claim does not even include the recitation of “updating the model” so it is unclear why this claim has been rejected by the Examiner. Appellants request that the Board reverse the rejection of Claim 26 under 35 U.S.C. § 112, first paragraph.

B. Rejections Under 35 U.S.C. § 103(a)

The Examiner has failed to make a *prima facie* case of obviousness because 1) the combination of references fails to teach each and every claim element and 2) because one of ordinary skill in the art would not combine the references as suggested by the Examiner. Specifically, the combination of references fails to teach at least any one of the following:

- a. calculating a set value for the density of the green liquor based on a model that relates total titratable alkali (TTA) to green liquor density; or
- b. updating the model using the measurement result of the density and total titratable alkali.

1. **The Combination of Baines, Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article Do Not Disclose or Suggest Each and Every Element of Claim 1.**

Applicants respectfully submit that the combination of Baines, Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article fails to disclose or suggest the claimed invention. Specifically, the combination of the cited references fails to disclose or suggest any of the following steps that are recited in Claim 1:

- a. calculating a set value for the density of the green liquor based on a model that relates total titratable alkali (TTA) to green liquor density; or
- b. updating the model using the measurement result of the density and total titratable alkali.

As discussed in greater detail below, the Examiner has failed to establish how the combination of references teach any of the above elements. Accordingly, it is respectfully requested that the Board overturn the rejection based on the combination of record.

In the present rejections, the Examiner has relied on a multitude of references in an attempt string together and link various properties of the liquor, such as density, conductivity, alkali strength, TTA, etc. to support his conclusion that it is known to use such properties to control the causticization process and as such the use of these properties in the claimed invention is obvious. In essence, the Examiner asserts that since such properties are known any future processes that use such properties are obvious. As in the present case, the Examiner's reasoning narrowly focuses on the prior art and completely ignores whether the claimed method employing the properties is disclosed or suggested by the reference. In doing so, the Examiner has failed to actually consider whether the claimed process is new and non-obvious in view of the prior art.

In the claimed invention as claimed in independent Claims 1 and 26, it is important that a target value for the total titratable alkali is determined and the density of the green liquor is

adjusted. Further, it is important that the set value of the density is specified as defined in the claims.

In sharp contrast, in conventional methods such as those described in the art cited by the Examiner (e.g., Bertelsen), a direct correlation between the TTA and density is presumed. In this regard, Appellants have submitted evidence (See Evidence Appendix) that show the relation between TTA and density. As can be seen from the measurement results, the correlation between TTA and density is very vague. In the conventional methods, such as those described in the prior art cited by the Examiner, it is presumed that the direct line drawn through the charts describes the alleged correlation. However, as can be seen in the charts, if this direct correlation is used, the results will be very poor in most cases.

In the claimed process, the model is updated using the measurement of the density and TTA so that the density can be reliably and accurately controlled. Contrary to the claimed invention, the conventional methods of the prior art only use the correlation:
 $D = TTA/kk$.

However, in the claimed invention, the same line is also used in addition to an offset that is determined by the measurement results of the density and the measurement result of the TTA. Thus, the claimed the claimed invention utilizes the correlation:
 $D = (TTA + os)/kk$. The use of the model and offset provide a process that provides for better control of the causticization process, and hence improved NaOH recovery.

a. The combination of references do not teach the step of calculating a set value for the density of the green liquor based on a model that relates total titratable alkali (TTA) to green liquor density.

The combination of the cited references also does not disclose or suggest the step of calculating a set-value for the green liquor density to be introduced into the slaker based on the measured TTA of the green liquor, a target value for the TTA, and a model that relates the measured TTA in the green liquor to the green liquor density. As discussed above, Claim 1 recites that the step of specifying the set value for the green liquor includes the step of

determining a target value for the TTA, measuring the TTA in the green liquor, providing a model that relates green liquor density to the measured TTA, and calculating the set value based on the measured TTA, target value for the TTA, and the model.

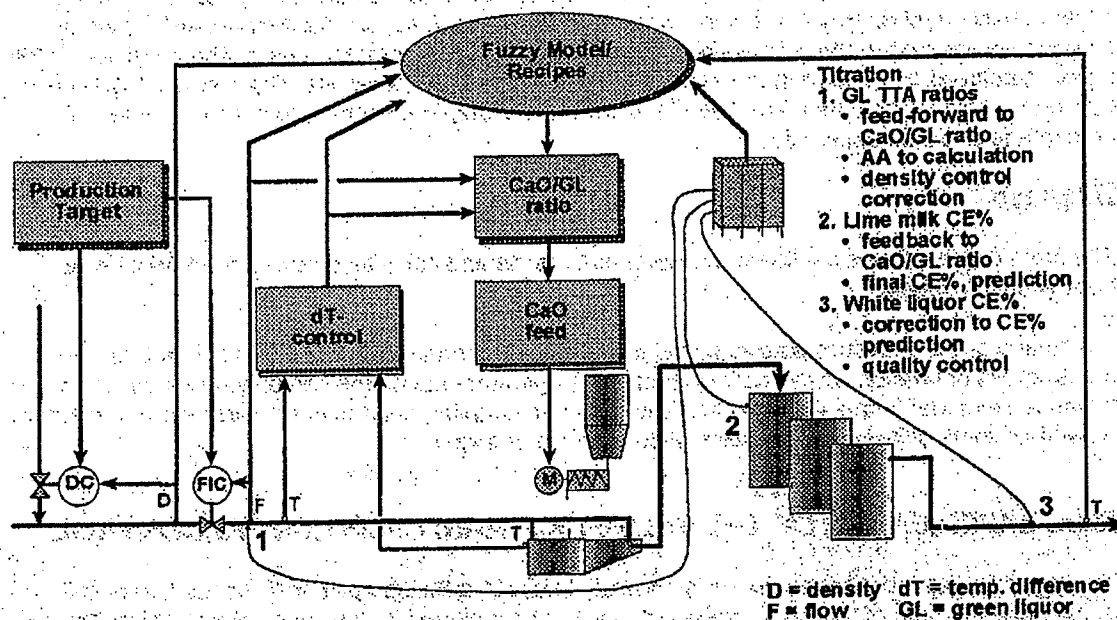
In contrast, Musow teaches controlling the causticization reaction by maintaining the concentration of the sodium carbonate at a desired level. Musow does not teach the step of determining a set value for the density, let-alone the step of calculating the set-value using a target TTA, the measured TTA, and a model that relates the measured TTA to density of the green liquor. Baines also fails to teach these steps. In contrast, Baines teaches that the amount of lime that is to be added to the slaker may be determined by measuring concentrations of the primary constituents of the green liquor and the white liquor: carbonate, hydroxide, and sulfide. These components are individually measured to provide the control system with a complete characterization of the reagents participating in the causticizing reaction so that each individual component may be accounted for by the control system. See column 3, lines 9-15. Thus, Baines also fails to disclose or suggest the step of determining a set value for the density, let-alone the step of calculating the set-value using a target TTA, the measured TTA, and a model that relates the measured TTA to density of the green liquor.

Hultman and Engdahl similarly fail to disclose or suggest the step of calculating a set value for the density of the green liquor based on a model that relates total titratable alkali (TTA) to green liquor density. In particular, Hultman fails to disclose or suggest a process in which a set value for the green liquor is determined based on the measured TTA of the green liquor, a target value for the TTA, and a model that relates the measured TTA in the green liquor to the green liquor density.

Engdahl does not disclose or suggest controlling the density of the green liquor being added to the slaker, or any desirability of doing so, let alone the claimed process in which a set value for the green liquor is determined based on the measured TTA of the green liquor, a target value for the TTA, and a model that relates the measured TTA in the green liquor to the green liquor density. In fact, there would be no motivation to do so because in the process of Engdahl, the white liquor already contains the slaked lime prior to the introduction of the green liquor. Since Engdahl does not disclose or suggest controlling the density of the green liquor, it certainly

does not disclose a process in which a set value for the green liquor is determined by based on the measured TTA of the green liquor, a target value for the TTA, and a model that relates the measured TTA in the green liquor to the green liquor density. In fact, Engdahl is completely silent with respect to measuring parameters, such TTA, density, and the like. Accordingly, Hultman and Engdahl also fail to disclose or suggest the step of calculating a set value for the density of the green liquor based on a model that relates total titratable alkali (TTA) to green liquor density.

Similarly, the Puhakka Article does not disclose or suggest specifying a set value for controlling the density of the green liquor by calculating the set value for green liquor density based on the measured TTA in the green liquor, the target value for the TTA, and a model that relates green liquor density to the measured TTA in the green liquor. In fact, the Puhakka Article describes a process that is different than that of the claimed invention. As shown below in FIG. 8 of the Puhakka Article, a value for the green liquor density is determined from a production target, and not from the measured TTA in the green liquor, the target value for the TTA, and a model that relates green liquor density to the measured TTA in the green liquor as recited in Claim 1.



In FIG. 8 of the Puhakka Article, it can be that a green liquor density value is determined based on the production target. Accordingly, the Pukahha Article fails to provide for the deficiencies of the previously cited art and therefore the combination of references fails to disclose or suggest calculating a set value for the density of the green liquor based on a model that relates total titratable alkali (TTA) to green liquor density, and updating the model using the measurement result of the density and total titratable alkali.

With respect to the Bertelsen reference, it is not clear why or how the Examiner is relying on this reference. In the Office Action of 2/13/2009 in which this reference was first cited by the Examiner, the Examiner states that this references teaches “measuring the TTA and conductivity, and any parameter can be measured, depending upon the system.” The Examiner provides no further guidance or reasoning in how the teachings of this reference are applicable to the claimed invention. As noted above, the Examiner has cobbled the numerous references in an attempt to establish a prima facie case of obvious just because the prior art teaches measuring these properties. However, the Examiner’s line of reasoning completely ignores how these measured values are used in the claimed invention, or in the context of the model that is used to calculate

the set value for the density.

In maintaining the rejection, the Examiner relies on Baines for the use of a computer system for controlling the causticizing process, and that it would therefore be obvious to use the computerized process described in Baines in combination with the claimed variables because Musow teaches that different variables can be monitored. For example, the Examiner in the Final Office Action dated January 3, 2006 states that “the claims are an indirect way of performing the control exerted more directly by the references [and that] this is an obvious expedient, given a known and well characterized reaction system and relationships between the species....” In essence the Examiner is asserting the invention is obvious because computer systems are known, measuring density is known, and measuring TTA is known. Further, the Examiner’s arguments show that he has narrowed the claimed invention down to what he perceives as the “gist” of the invention, i.e., measuring TTA and density of the green liquor. This can surely not be the standard by which proper rejections are made.

In addition, the Examiner’s reasoning completely ignores or conveniently overlooks how the TTA and the density of the green liquor are used in the method steps recited in Claim 1. For example, the Examiner has not addressed where the references disclose or suggest the steps of 1) specifying a set-value for the green liquor by: 2) determining a target value for the TTA; 3) providing a model that relates green liquor density to the measured TTA; and 4) calculating the set value for the green liquor density based on the measured TTA of the green liquor, the target value for the TTA, and the model. The Examiner has not provided a reasonable basis for where these method steps can be found in the combination of the cited references. Rather, the Examiner attempts to compensate for these deficiencies by making broad statements that the workings of how the computer makes calculations are deemed conventional and that the differences between the references and claims is which variables are monitored without every providing analysis of how the cited references disclose or suggest the recited method steps. In other words, the Examiner has failed to ascertain the differences between the prior art and the claimed invention because the Examiner has narrowly focused on the parameters of measuring TTA and density while completely ignoring the actual method steps recited in the claims. Thus, the Examiner has failed to compare the actual teachings of the references to the claims and has

therefore failed to follow the standard for making an obviousness rejection as articulated by the *Supreme Court in Graham v. John Deere*, 383 U.S. 1 (1966): i.e., ascertaining the differences between the prior art and the claims in issue. This is not the proper inquiry in making an obvious rejection.

b. The combination of references do not teach the step of updating the model by using the measurement result of the density and the measurement result of the total titratable alkali, as recited in independent Claim 1.

As discussed above, none of the cited references discloses or suggest as method in which a set value for the density is calculated based on the measured total titratable alkali in the green liquor, the target value for the total titratable alkali, and the model. Additionally, the combination of the cited references also do not disclose or suggest the step of updating the model by using the measurement result of the density and the measurement result of the total titratable alkali.

In the rejections, the Examiner has failed to cite to any reference where such a teaching can be found. In fact, the Examiner continues to rely on broad nebulous statements in support of the rejection, such as “the workings of how the computer makes calculation is deemed conventional as how computer programs work.” However, such statements are insufficient to provide support for the rejections or to make up for the shortcomings of the cited references. The Examiner has the burden to show that each and every element of the claim is disclosed or suggested by the prior art. The Examiner has failed to meet this burden and therefore the rejections should be reversed.

For the reasons set forth above, Applicants respectfully submit that the combination of Baines, Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article fails to disclose or suggest each and every element recited in Claim 1. Appellants respectfully request that the Board overturn this rejection.

2. **The Combination of Baines, Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article Do Not Disclose or Suggest Each and Every Element of Dependent Claim 11.**

Claim 11, which is dependent on Claim 1, recites that the density of the green liquor is calculated according to the following equation:

recites that the green liquor density is controlled on the basis of a total titratable alkali by applying the following equation:

$$D = (TTA + os) / kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same,

the offset being determined on the basis of the model.

None of the cited references disclose or suggest the above recited equation. The Examiner has failed to show where the equation and its various variables can be found in the references. In maintaining the rejection, the Examiner relies on vague statements that the workings of how the computer makes calculations are known and therefore it would be obvious to use the equation recited in Claim 11. However, such statements cannot support an obviousness rejection. If the Examiner's assertion was true, it is a wonder that any additional patents utilizing mathematical equations and computers could ever be obtained. The Examiner has the burden of showing where the equation recited in Claim 11 is disclosed or suggested in the cited references; he has not met this burden. Thus, Appellants respectfully submit that Claim 11 is patentable over the rejection of record.

3. **The Combination of Baines, Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article Do Not Disclose or Suggest Each and Every Element of Independent Claim 26.**

Independent Claim 26 recites a process for controlling the causticizing reaction in which the set value for the green liquor density is determined utilizing the following equation:

$$D = (TTA + os) / kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset, which is determined using a model having as parameters the green liquor TTA and momentary density of green liquor; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same.

The process recited in Claim 26 utilizes variables for the TTA of the green liquor, a constant angular coefficient "kk", and an offset "os" that is determined from a model having parameters for the green liquor TTA and the momentary density of the green liquor. For the same reasons discussed above, the cited references also fail to disclose or suggest the above-equation, which is recited in Claim 26. As discussed above, the Examiner has failed to show where the equation and its various variables can be found in the references.

Additionally, the cited references also fail to disclose or suggest the step of introducing an effective amount of a white liquor stream into the green liquor as recited in Claim 26. For example, the cited references disclose controlling the causticizing process by adding lime to the slaker or weak white liquor to the dissolving tank, which is discussed in greater detail above.

Thus, the combination of the cited references also fails to disclose or suggest each and every element recited in Claim 26. Accordingly, it is respectfully submitted that Claim 26 is patentable over the rejection of record.

4. There is no Motivation to Combine the teachings of Baines and Musow

Appellants respectfully submit that one of ordinary skill in the art would not combine Baines with any one of Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article in the manner contemplated by the Examiner. Specifically, one of ordinary skill in the art would not combine the teachings of Baines with variable measurements described in Musow Hultman, Engdahl, Bertelsen, and the Puhakka Article. Further, one of ordinary skill in the art would not expect that the references can be combined in a predictable manner.

First, the methods described Baines are completely different than those described in Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article.

As noted above, Musow teaches regulating the sodium carbonate concentration of a green liquor in a dissolving tank by measuring conductivity of the green liquor in the dissolving tank. See e.g., column 2, lines 44 – 47. In particular, Musow teaches calculating the concentration of a single component, e.g., utilizing conductivity measurements, to maintain a desired level of sodium carbonate within the green liquor. The Puhakka Article teaches measuring TTA and Bertelsen teaches measurement of TTA and conductivity.

In sharp contrast, Baines includes multiple statements that teach away from using measurements, such as conductivity, density, and TTA, in controlling the causticizing reaction. First, Baines repeatedly emphasizes that using a single characteristic, such Na_2CO_3 concentration, conductivity, TTA, or density, in controlling the causticization reaction provides less accuracy and therefore is undesirable. For example, Baines states that “a measurement of a single characteristic of the entire white or green liquor, as taught by Bertelsen, can result in error....” See column 2, lines 27-29. Baines further elaborates that “Bertelsen teaches that the progress of the causticizing reaction can be measured by making a differential conductivity measurement.” See column 2, lines 17 – 19. From these excerpts, it can be seen that Baines clearly teaches away from the process described in Musow, and away from using measurements, such as TTA or density, as recited in the claimed process. Baines further states at column 6, lines 10 – 14 that [r]ather it is the determination of the relative concentrations of the liquor components, as opposed to a measurement of a characteristic of the total liquor that is important to the methods of the present invention.” Thus, the teachings of Baines include numerous

statements that would teach away from the combination of Baines with any one of Musow, Hultman, Engdahl, Bertelsen and the Puhakka Article.

Hultman and Engdahl also fail to provide the necessary motivation to combine the references. Engdahl is completely silent with respect to measurements, such as density, TTA, and the like. Hultman describes measuring carbonate ion concentration of the starting green liquor, and the carbonate ion content of the causticized white liquor to determine how much lime is to be added to the slaker. As discussed above, Baines teaches against using such measurements. In fact, Baines specifically teaches the undesirability of the method described in Hultman. For example, Baines states that the “the Hultman method measures only a sample of the liquor. The measurement is relatively complex in that it involves introducing an additional reaction to create a by-product, CO₂, that can be measured. The measurement of CO₂ is not directly related to the causticizing reaction and is therefore only an inferred measurement.” See column 2, lines 8 – 14. Thus, Baines clearly teaches away from the process described in Hultman and one of ordinary skill in the art would not be motivated to modify the process of Baines to include measuring single components of the green and white liquors as taught in Hultman.

It is clear that Baines goes to great extent to distance the process described therein from the teachings of Musow and Hultman, which utilize a single measurement, such as conductivity or carbonate ion concentration, to control the causticization process. In light of this clear teaching away from Musow and Hultman, there would be no motivation to combine the teachings of Baines with either Musow or Hultman in the manner contemplated by the Examiner. For this additional reason, Applicants respectfully request that the Board overturn the rejection of record.

The Examiner attempts to rebut this clear teaching away by stating that relying upon one measurement cautioned against by Baines is an obvious expedient given that one is warned of the risks and given the simplified apparatus requirement of having only one thing to measure. However, this argument ignores and mischaracterizes the teachings of Baines. Baines teaches away from measurements, whether it is a single measurement or a combination of measurements,

in which the measurement is a single characteristic of the entire white or green liquor, such as density, TTA, or conductivity.

Further, one of ordinary skill in the art would not expect that the measurements of Musow or any of the other cited references could be successfully combined with the teachings of Baines to arrive at the claimed invention. In fact, the teachings of these references lead to the conclusion that they cannot be combined in a predictable manner. In other words, one of ordinary skill in the art would not predict that Baines could successfully be combined with any one of Musow, Hultman, or Engdahl to provide a process that facilitates control over the causticizing process because Baines specifically teaches against using the measurements described in these references. For this additional reason, the rejections based on the combination of Baines Musow, Hultman, Engdahl, Bertelsen and the Puhakka article should be reversed.

Further, Musow also teaches away from the claimed invention. Specifically, Musow states that conductivity measurements are superior and more accurate than indirect measurements such as TTA measurements of the green liquor. For example, Musow states “[t]he above-described method regulates sodium carbonate concentration based on measurements that are more accurate than such indirect measures as density of the green liquor or total titratable alkali in the green liquor.” See e.g., column 2, lines 58 – 63. By teaching that TTA measurements are inferior, Musow teaches away from using TTA measurements of a green liquor for control purposes, and one of ordinary skill in the art would not be motivated to combine the conductivity measurements, or even TTA measurements, of Musow with a control system such as the Baines system. Thus, one of ordinary skill in the art would not be motivated to combine Baines with any one of Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article.

In maintaining the rejections, the Examiner has repeatedly ignored the multiple teachings in both Baines and Musow that teach away from the claimed invention and teach away from the combination of Baines and Musow. Therefore, it is respectfully requested that the rejections of the claims based on the combination of Baines, Musow, Hultman, Engdahl, Bertelsen, and the Puhakka Article be reversed.

8. ***Claims Appendix.***

An appendix containing a copy of the claims involved in the appeal.

9. ***Evidence Appendix.***

An appendix containing a chart showing the correlation between density and TTA is provided.

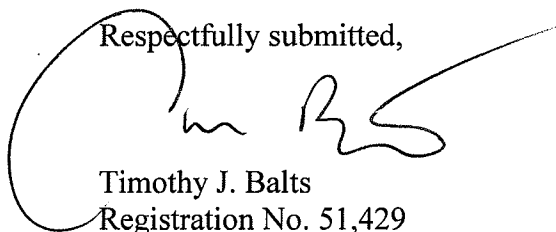
10. ***Related Proceedings Appendix.***

There are not decisions by a court of the Board in related proceedings.

CONCLUSION

In view of the foregoing arguments, Appellant respectfully submits that Claims 1-6, 8-12, 14, 15, and 26 are patentable over the cited references. A decision from the Board of Patent Appeals and Interferences reversing the final rejection of the pending claims is therefore earnestly solicited.

Respectfully submitted,

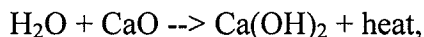


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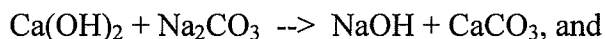
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CLAIMS APPENDIX

1. (Previously Presented) A method for controlling a causticizing process for producing white liquor from green liquor by feeding green liquor (H_2O , Na_2CO_3 , and Na_2S) and lime (CaO) into a slaker to produce hydrated lime ($\text{Ca}(\text{OH})_2$) according to the equation



causticizing the green liquor by reacting the hydrated lime and sodium carbonate (Na_2CO_3) within the green liquor to produce sodium hydroxide (NaOH) and calcium carbonate (CaCO_3) according to the equation



separating the calcium carbonate from the sodium hydroxide, the method comprising controlling the causticizing process by:

- measuring the density of the green liquor being fed to the slaker;
- controlling the density of the green liquor being fed to the slaker towards a set value with a density controller; and,
- specifying the set value by:
 - determining a target value for the total titratable alkali;
 - measuring the total titratable alkali in the green liquor being fed to the slaker;
 - providing a model that relates green liquor density to the measured total titratable alkali in the green liquor;
 - calculating the set value for green liquor density based on the measured total titratable alkali in the green liquor, the target value for the total titratable alkali, and the model; and,
- updating the model by using the measurement result of the density and the measurement result of the total titratable alkali.

2. (Original) A method according to claim 1, wherein the causticizing process is controlled by applying a model describing the slaker.

3. (Previously Presented) A method according to claim 2, wherein the slaker is controlled on the basis of the difference between the slaker temperature and the green liquor temperature by adjusting the set value for the temperature difference control on the basis of the difference between the target causticity of lime milk and the causticity titration or titrations, the set value for the causticity being determined on the basis of the model describing the development of the causticity prevailing after the slaker to white liquor causticity.

4. (Previously Presented) A method according to claim 3, wherein the model in question is a static one and determines a causticity difference.

5. (Previously Presented) A method according to claim 4, wherein a quotient is calculated by dividing an average of the differences in white liquor and lime milk causticities by a causticity difference provided by the model on the basis of a production average, and the causticity difference produced by the model is multiplied by the quotient.

6. (Original) A method according to claim 5, wherein the average is calculated for a period of 2 to 40 hours.

7. (Cancelled)

8. (Previously Presented) A method according to claim 3, wherein the lime to green liquor ratio is controlled by adjusting the lime to green liquor ratio using the temperature difference control in such a way that when the measured temperature deviates from the temperature target, the lime to green liquor ratio target is changed in the opposite direction.

9. (Previously Presented) A method according to claim 8, wherein in connection with a production change, the lime to green liquor ratio is changed on the basis of a static model describing the changing of the lime to green liquor ratio during a production change.

10. (Previously Presented) A method according to claim 9, wherein the static model describing the changing of the lime to green liquor ratio during a production change substantially conforms with a production curve.

11. (Previously Presented) A method according to claim 1, wherein green liquor density is controlled on the basis of a total titratable alkali by applying the following equation:

$$D = (TTA + os) / kk,$$

where D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset; and

kk is a coefficient, wherein the coefficient is a constant angular coefficient having a value selected from between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same,

the offset being determined on the basis of the model.

12. (Previously Presented) A method according to claim 11, wherein the offset is determined on the basis of the green liquor TTA and a momentary density of the green liquor by applying the model including the coefficient.

13. (Cancelled)

14. (Original) A method according to claim 11, wherein the model is specified by calculating averages for the variables used in the model.

15. (Original) A method according to claim 14, wherein after a sufficient green liquor flow and regular titrations for 1 to 40 hours, averages of desired variables calculated over 1 to 40 hours are used in the model.

16 – 25 (Cancelled)

26. (Previously Presented) A method for controlling a slaker within a causticizing process which comprises

- (a) measuring the total titratable alkali within a green liquor inlet stream;
- (b) determining the density of said green liquor inlet stream based on said total titratable alkali; and

(c) adjusting the density of said green liquor inlet stream,
wherein the density of the green liquor inlet stream is determined using the following
equation:

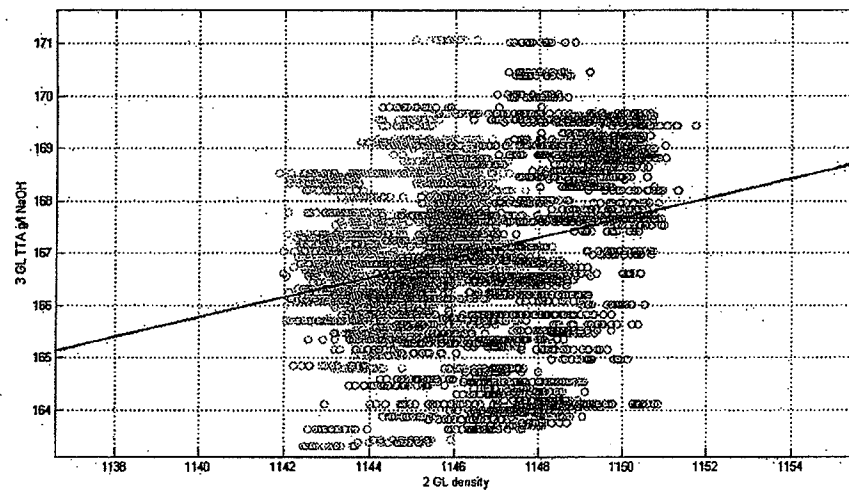
$$D = (TTA + os) / kk,$$

wherein: D is the green liquor density;
TTA is the total titratable alkali of the green liquor;
os is an offset, which is determined using a model having as parameters the green
liquor TTA and momentary density of green liquor; and
kk is a constant angular coefficient, wherein the coefficient is a constant angular
coefficient the value of which is between 0.9 and 1.4 when the unit used for
expressing the TTA and the density is the same.

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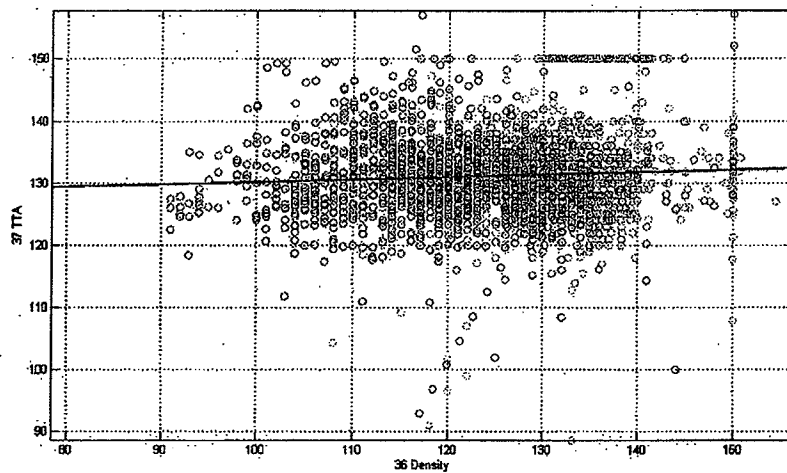
EVIDENCE APPENDIX

X-Y plot, 2 GL density, 3 GL TTA g/l NaOH, modeling, preprocessed
File: Excel worksheet, stretch 1:7187



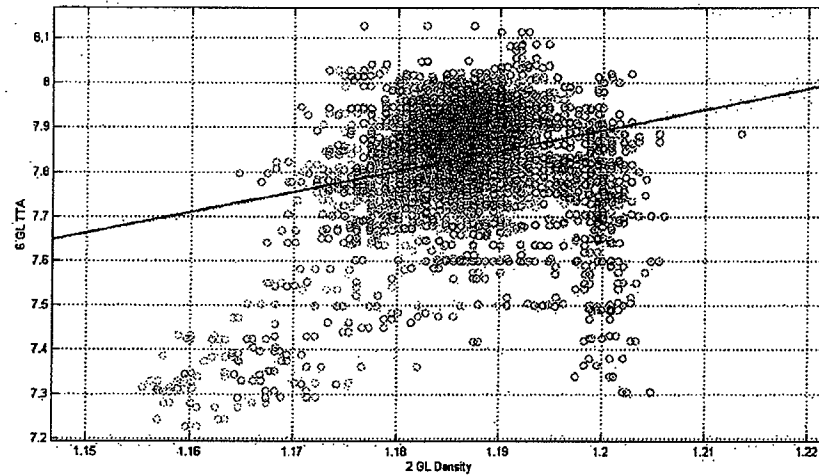
$$y = +0.18895 \pm 0.0089344 * x - 49.621 \pm 10.128, \text{ linear } r = 0.24653, R^2 = 0.061$$

X-Y plot, 36 Density, 37 TTA, modeling, preprocessed
File: Excel worksheet, stretch 1:2696



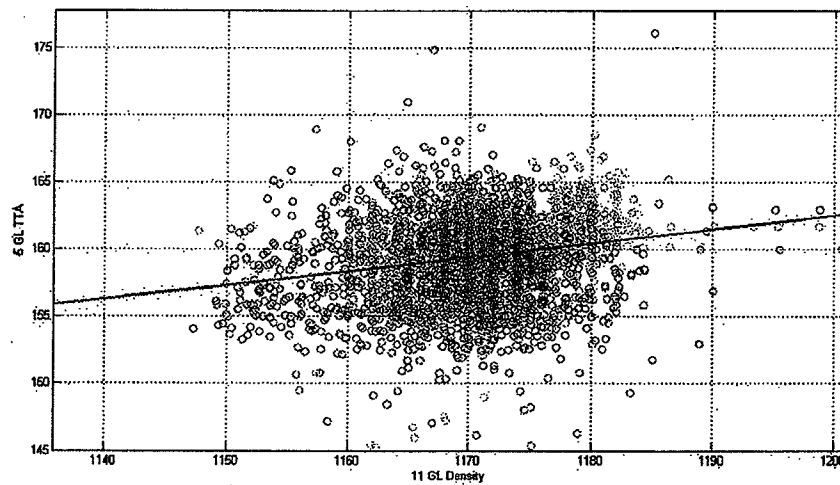
$$y = +0.03854 \pm 0.012652 * x + 126.3755 \pm 1.5809, \text{ linear } r = 0.05835, R^2 = 0.003$$

X-Y plot, 2 GL Density, 6 GL TTA, modeling, raw
File: Excel worksheet, stretch 1:4823



$$y = +4.6069 \pm 0.2643 \cdot x + 2.3655 \pm 0.31356, \text{ linear } r = 0.24708, R^2 = 0.061$$

X-Y plot, 11 GL Density, 5 GL TTA, modeling, raw
File: Excel worksheet, stretch 1:3648



$$y = +0.10391 \pm 0.0076222 \cdot x + 37.6607 \pm 9.156, \text{ linear } r = 0.21892, R^2 = 0.048$$